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## United States Department of Agriculture,

BUREAU OF ENTOMOLOGY,

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## THE GREEN-STRIPED MAPLE WORM.

*(Anisota rubicunda* Fab.)<sup>a</sup>

By L. O. HOWARD and F. H. CHITTENDEN.

## GENERAL APPEARANCE AND METHOD OF WORK.

Maple trees grown in the United States for shade or other purpose are subject to severe injury from defoliation by caterpillars. In addition to the fall webworm<sup>b</sup> and tussock moth caterpillar<sup>c</sup> there is a common and troublesome species known as the green-striped maple worm (*Anisota rubicunda*) which affects maples of all kinds, including sugar maple, and is especially partial to silver and swamp maples. It feeds occasionally also on box-elder and will defoliate oak in the absence of its favorite food trees.

In its active stage this insect is a naked or hairless caterpillar (fig. 1, *d*, *e*) of large size and somewhat attractive appearance, being pale yellowish green, longitudinally striped with dark green. It is armed just back of the head, on the second thoracic segment, with a pair of long black horns. It has also a number of short, black, spiny projections along its sides and at its anal extremity. The anal segments are somewhat dilated and rose-colored on the sides. When fully grown, it measures nearly two inches in length.

The parent insect, or moth, is a beautiful creature of a pale yellow color shaded with a most delicate pink. The female is well shown in the accompanying illustration (*a*), the dark portions representing the pink, and the paler portions the yellow color. In eastern individuals the colors differ from those found in the West, the rose tints being more intense, while in the western forms the yellow predominates, with only a slight tinge of rose. Some western individuals also are nearly white. The female has a wing spread of one and three-fourths to about two inches, and her body is yellow and woolly in appearance. Her head is small, retracted into the thorax, and bears short, thread-like antennæ. The male is smaller than his mate, having plumose or feathery antennæ, as represented in the figure (*♂*).

The egg is about one millimeter in diameter, slightly flattened, and pale green, becoming yellowish before the larva hatches. A portion of

<sup>a</sup> Formerly called *Dryocampa rubicunda* Fab.<sup>b</sup> *Hyphantria cunea* Dru.<sup>c</sup> *Hemerocampa* (*Orgyia*) *leucostigma* Dru.

an egg mass is figured in the illustration at *c*, and a much-enlarged egg with the embryo within at *b*. The pupa is very dark brown, nearly black, and of the somewhat peculiar form shown at *f*. It is armed with little spines on the margin of the abdominal segments and on the thorax, and the anal segment ends in a projection a little forked at the tip.

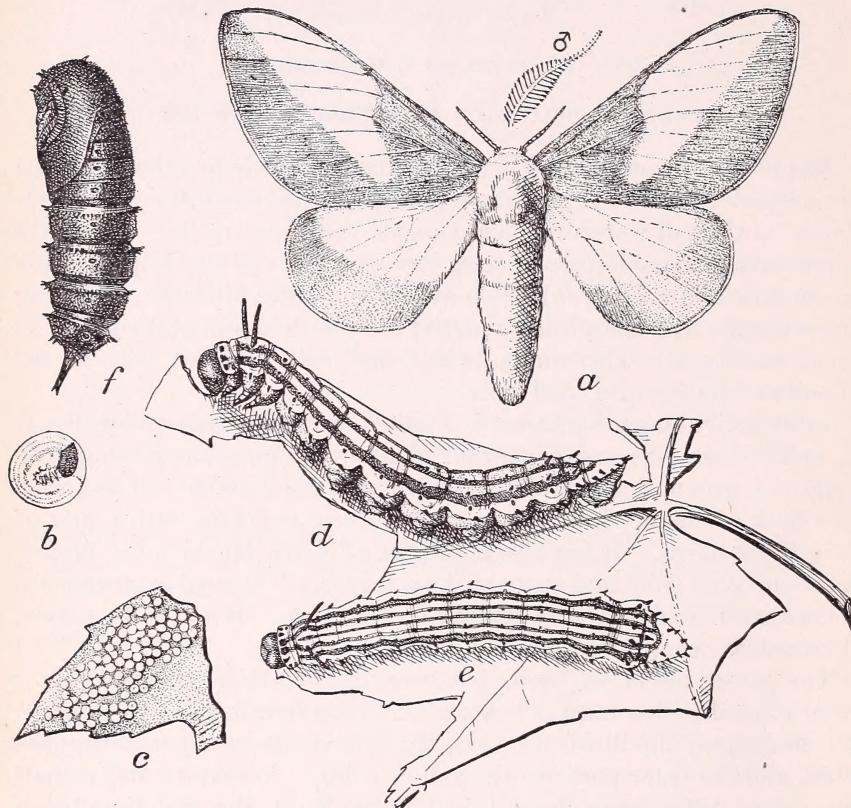


FIG. 1.—*Anisota rubicunda*: *a*, Female moth and antenna of male moth; *b*, egg, showing embryo within; *c*, portion of egg mass; *d*, full-grown larva from side; *e*, same from back; *f*, pupa. Enlarged. (Original.)

#### ORIGIN AND DISTRIBUTION.

The green-striped maple worm is a native North American species and is more abundant in the West than in the East, although it enjoys a considerable range. It abounds especially in Kansas, Nebraska, Missouri, Illinois, and Iowa, occurring also in the Gulf States, occasionally doing considerable damage in Mississippi. It extends sometimes in injurious numbers North and East, and has attracted some attention by its ravages in West Virginia, the District of Columbia, New Jersey, and in a limited portion of New York State. Instances

are on record of its occurrence in great numbers in Dutchess and Sullivan counties in New York, but these occurrences were exceptional.

#### LIFE HISTORY AND HABITS.

The moths issue from over-wintering pupæ or chrysalides in May or June, according to locality, and pair, the females depositing their eggs on the under side of the leaves. The number of eggs laid by a single female has not been ascertained, but is known to reach at least 150. In eight or ten days the eggs hatch, and the caterpillar emerges and feeds and grows apace. After passing through four molts in about a month it reaches full growth, when it enters the ground to transform to pupa. At the end of two weeks, or a little longer, the pupa, by means of the sharp and horny projections which have already been described, works its way to the surface of the ground and gives forth the moth. Soon afterwards the female, after copulation, lays eggs for a second generation.

In the District of Columbia it has been ascertained that there are usually three generations in the course of a year, although in Missouri, according to Riley, there are only two. Pupæ of the second generation in the West and of the third generation in the East over-winter. Even as far north as Massachusetts Harris showed the probability of two generations annually.

#### INSTANCES OF INJURY.

Many of the earlier writers on economic entomology reported numerous instances of injury by this species, but of late the insect has not received much attention, presumably because of the far greater destructiveness of the commoner tussock moth and fall webworm, and of the gipsy and brown-tail moths. Possibly this maple worm is decreasing in numbers. Some characteristic outbreaks may be mentioned, therefore, as showing its importance some years and to give some idea of its method of work.

In 1887 Mr. H. W. Young, Independence, Kans., wrote that for four years the soft maple shade trees of that city had been defoliated twice a year by this insect, the trees being greatly weakened. In 1888 Mrs. M. T. McCluny, Sedalia, Mo., wrote that these "worms" "were like the locusts of Egypt, and filled the houses" and destroyed the leaves of the maple shade trees. In 1889 considerable correspondence was had with Mr. J. W. Merchant, Kansas City, Mo., who reported extensive defoliation in Kansas City, Kans., and sent several photographs, one of which is here reproduced (fig. 2). In cases where adjoining maple and elm trees branched into each other the elm trees were never touched. During the period from 1888 to 1890, at Lincoln, Nebr.,

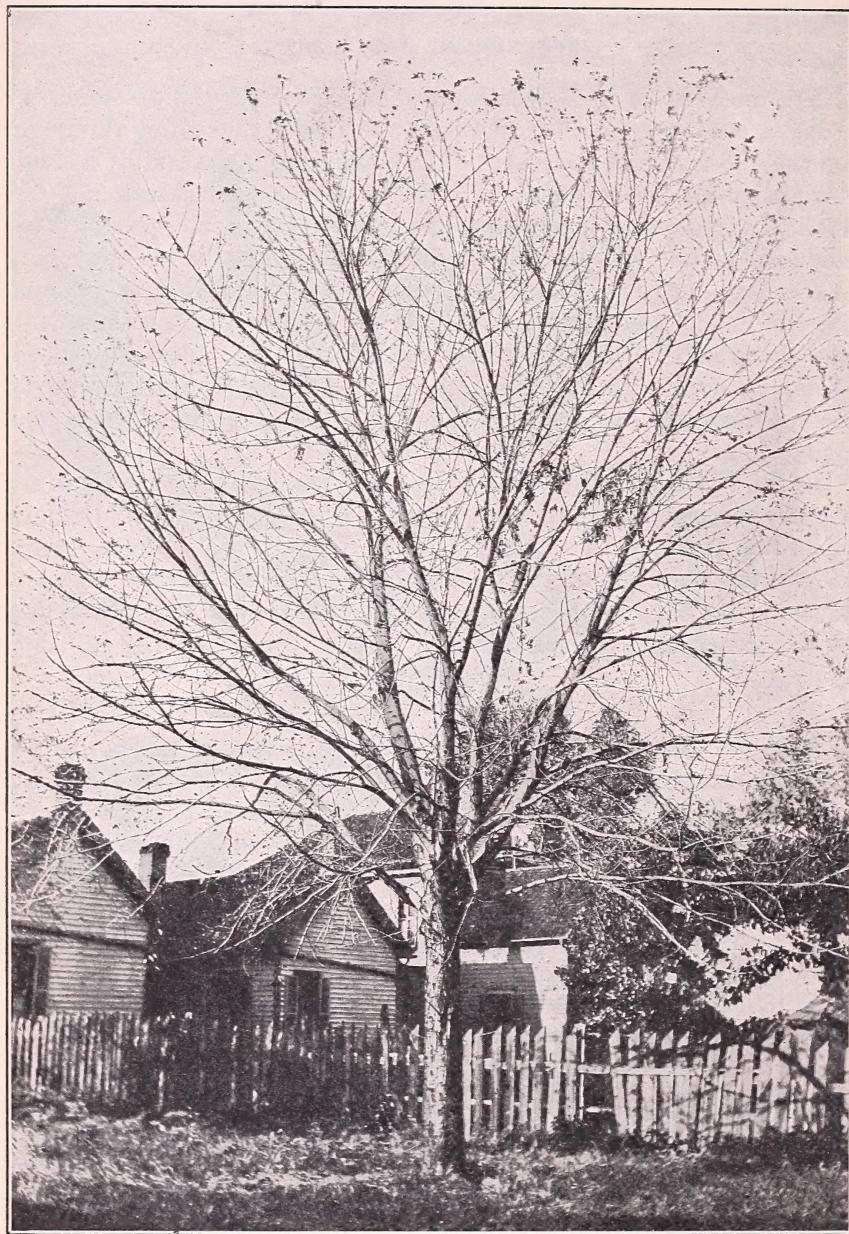


FIG. 2.—Maple tree at Kansas City, Kans., defoliated by green-striped maple worm. (Original.)

[Cir. 110]

many rows of large maples were entirely defoliated, rendering them very unsightly. (See fig. 3.) At about the same time Doctor Riley reported similar complete defoliation on the grounds of the State agricultural college at Manhattan, Kans., and of the State university at Lawrence, Kans. In 1901 Mr. F. E. Brooks reported great damage to the foliage of maple in the vicinity of French Creek, W. Va. Since 1905 the species has been abundant in portions of Maryland and Virginia, but not noticeably troublesome.

During 1908 it was devastating forests in and around Fryeburg, Me. At that time it almost entirely stripped maple and—it was said—oak, beech, birch, apple, and other deciduous trees over a very large section, but it seems probable that other species were present, as in other cases reported to this office.<sup>a</sup> It was particularly troublesome to shade maples in Maine, New Hampshire, and Pennsylvania.

#### NATURAL ENEMIES.

The green-striped maple worm is frequently eaten by domestic fowls and by many birds. Of these the robin and yellow-billed cuckoo have been recorded by Bruner.<sup>b</sup> He reports both of these birds as actively engaged in picking up and swallowing the "worms" as late as September 20, at Lincoln, Nebr. The bluebird, tufted titmouse, red-headed woodpecker, red-eyed vireo, and crow blackbird are also stated by the late Prof. F. H. Snow to eat the "worms," while the moths also are sometimes destroyed by birds. To the above list Prof. F. E. L. Beal, of the Bureau of Biological Survey, adds the black-billed cuckoo and the great-crested flycatcher as enemies of this insect.

This species is parasitized by a common ichneumon fly, *Limnerium fugitivum* Say, a rather general parasite of lepidopterous larvæ. Two tachina flies have been reared from it, *Frontina frenchii* Will., from Washington, D. C., and vicinity, and *Belvosia bifasciata* Fab., from northern Missouri. Among the old Riley notes is a record of the rearing of an egg parasite, but the species has not been determined.

At one time the electric lights in some of the large cities mentioned were the means of attracting and destroying large numbers of the moths, and both moths and caterpillars were destroyed in large numbers by passers-by, who trampled on them.

As a rule little is to be expected from tachina flies as a means of controlling insect pests, and the ichneumon mentioned, being a general parasite, is not an efficient destroyer of this particular species. In

<sup>a</sup>The other species concerned in damage were *Heterocampa guttivitta* Walk. and *H. bilineata* Pack., principally to forest trees, although during the year they injured maple groves and attacked sugar maple and a considerable variety of the forest trees in New England.

<sup>b</sup> Lawrence Bruner, 1890, Bull. 14 Nebr. Agr. Exp. Sta., pp. 54-59.

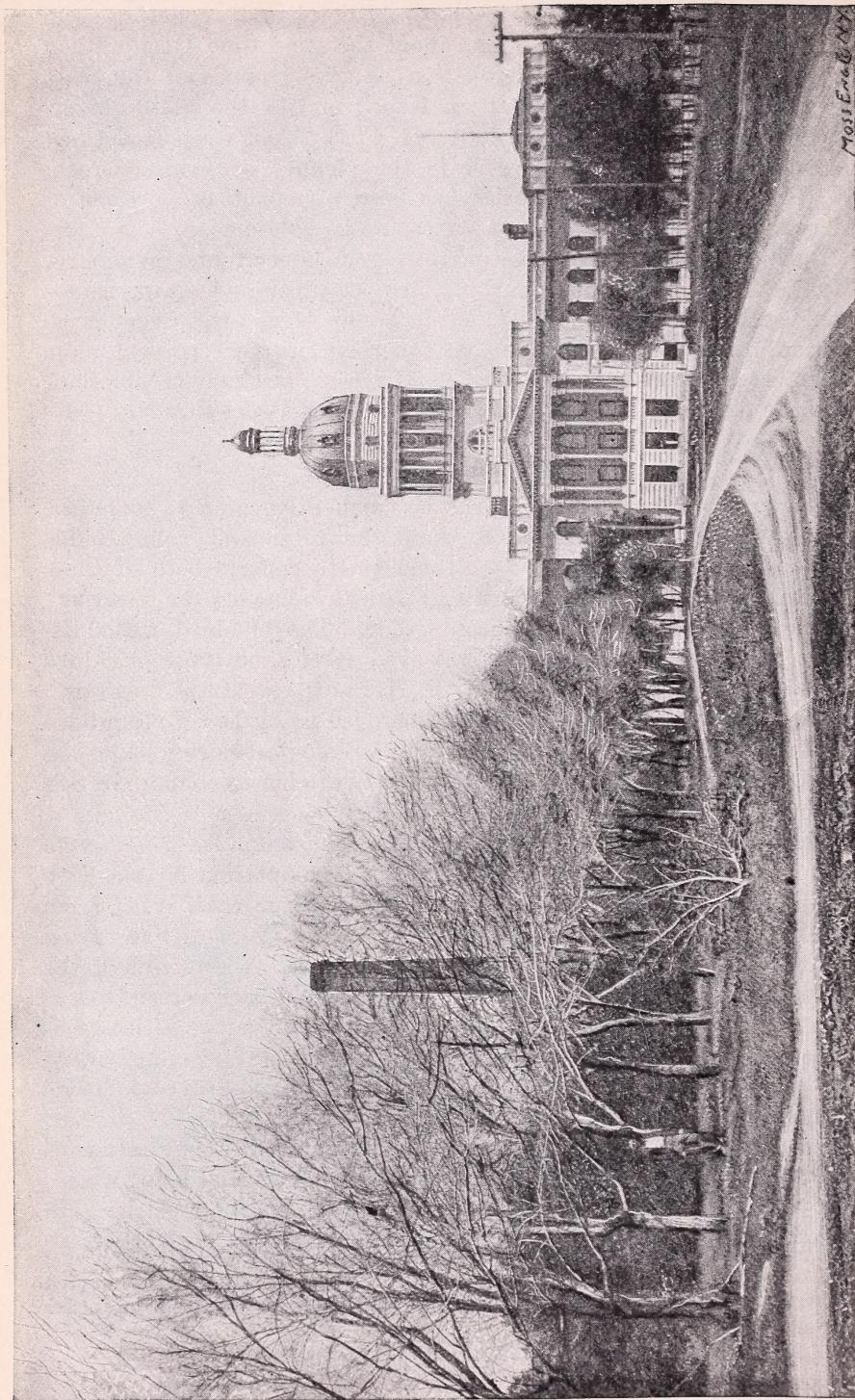


FIG. 3.—State Capitol at Lincoln, Nehr., showing trees defoliated in 1890 by the green-striped maple worm.

other words, we can not rely for assistance upon any of the natural enemies except birds. These should be encouraged in every possible way, and warfare should be waged against the English sparrow, which does not feed on this caterpillar, save perhaps occasionally in nesting time, and is a great pest in itself, especially as it drives other and useful birds from cities and towns.

**REMEDIES.**

*Arsenicals.*—Spraying with an arsenical mixture, if accomplished when the caterpillars are young, is the most effective means of controlling this insect, but a spraying is not easily applied when a large grove of maples is infested. Either Paris green or arsenate of lead may be used and applied in accordance with the directions furnished for other shade-tree defoliators, as described in detail in Farmers' Bulletin No. 99. This publication should be in the hands of all persons suffering from the ravages of shade-tree insects, and that portion relating to general instructions in the last chapter should be read.<sup>a</sup> Paris green may be applied on maple trees as strong as 1 pound to 50 gallons of water, but half that strength, or one-half pound to 50 gallons of water, will probably suffice in most cases. Arsenate of lead may be safely used at as high a rate as from 2 to 4 pounds of the poison to 50 gallons of water.

*Trenching.*—If an arsenical spray has not been used while the larvæ are young, large numbers of the pests may be trapped and easily destroyed by digging a trench either around individual trees or around groves or belts of trees. The trench should be at least a foot deep, with the outer walls sloping under. The larvæ usually wander away from the trees before entering the earth, and will be caught in the trench in great numbers or will bury themselves in the ground in the bottom of the trench, where they can be killed. This remedy was given a practical and thoroughly satisfactory test many years ago by Doctor Riley, and has been recommended to our correspondents generally.

*Hand picking.*—When the public once becomes well acquainted with this insect in all of its stages, from the egg to the moth, large numbers of the eggs and the moths can be killed by hand on their appearance in May or June, and individual choice trees may in a measure be protected in this manner.

Approved:

JAMES WILSON,

*Secretary of Agriculture,*

WASHINGTON, D. C., May 26, 1909.

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<sup>a</sup> Farmers' Bulletin No. 99 is furnished gratis on application to the Department of Agriculture.

